WHAT IS CLAIMED IS:

1. A waveguide comprising:

a first layer of dielectric material;

a second layer of dielectric material positioned adjacent to said first layer of dielectric material, said second layer of dielectric material having a dielectric constant that is less than the dielectric constant of said first layer of dielectric material;

first and second electrodes for applying a controllable voltage across said first dielectric material, thereby controlling a dielectric constant of said first dielectric material, wherein at least one of said electrodes is positioned between said first and second layers of dielectric material;

a microstrip positioned adjacent to a first edge of each of said first and second layers; and

first and second ground planes positioned on opposite sides of said microstrip.

2. A waveguide as recited in claim 1, further comprising:

means for applying a controllable voltage across said second dielectric material, thereby controlling a dielectric constant of said second dielectric material.

3. A waveguide as recited in claim 1, further comprising:

a plurality of additional layers of dielectric material positioned generally in parallel with said first and second layers of dielectric material, at least selected ones of said additional layers of dielectric material having a tunable dielectric constant.

4. A waveguide as recited in claim 1, wherein said first layer of dielectric material has a dielectric constant greater than about 100 and a loss tangent less than about 0.01.

5. A waveguide as recited in claim 1, wherein said second layer of dielectric material comprises one of: a $Ba_{1-x}Sr_xTiO_3$ composite where x ranges from zero to one, alumina, mica, and air.

6. A waveguide as recited in claim 1, wherein said first and second layers are generally rectangular slabs lying in planes that are oriented parallel to a direction of propagation of a radio frequency signal through the waveguide.

7. A waveguide as recited in claim 1, wherein said first dielectric material comprises one of: BSTO, BSTO-MgO, BSTO-$MgAl_2O_4$, BSTO-$CaTiO_3$, BSTO-$MgTiO_3$, BSTO-$MgSrZrTiO_6$, or a combination thereof.